

INTRODUCTION

Although a complete inventory of the vascular plants on Pine Butte Preserve has not yet been completed, 14 species listed by the Montana Natural Heritage Program as species of special concern have been found on the Preserve. All but one of these plants are found in wetlands, especially the large fens around Pine Butte. This is primarily because the fens are the most unique vegetation feature on the Preserve and because the wetlands have had the only thorough inventory. Other species of rare plants will undoubtedly be found as the flora of the area becomes better known.

Two features, the large peatlands and the calcareous nature of the rock in the area, combine to provide the unique conditions needed by many of these rare species. Six of the species, Carex livida, Eriophorum viridicarinum, Gentianopsis macounii, Kobresia simpliciuscula, Scirpus cespitosus and Scirpus pumilus, have a boreal or circumboreal distribution and are more common in the boreal regions of Canada, Europe and Asia. All of these species are restricted to the fens, and all are in the Sedge Family (Cyperaceae). Many of the rare plants on the Preserve are strongly associated with alkaline conditions or calcareous geologic parent materials throughout all or much of their range. These include Carex crawei, C. livida, Cypripedium calceolus, Eleocharis rostellata, Gentianopsis macounii, Kobresia simpliciuscula, Oxytropis lagopus var. conjugens and Triglochin concinnum.

Two status classifications related to the rarity of a species are employed in the following descriptions. The heritage rank consists of two parts: the global (G) rank and the state (S) rank; both depend on the number of known populations. A rank of 1 (critically imperiled) indicates that five or fewer populations are known, a rank of 2 (imperiled) means 6-20 populations, and a rank of 3 (rare) means 21-100 populations. A rank of 4 or 5 indicates that the species is probably secure. Thus, a rank of G5/S1 means that the species is secure on a global basis, but five or fewer populations are known in Montana. A Montana status of sensitive indicates that the species is thought to be rare in Montana. Threatened or endangered suggests that the plant is threatened by man-caused activity. Uncommon species that may fit into one of the above three categories but for which more information is needed are on the watch list. Species that are locally common in only a relatively small area of Montana are plants of limited distribution. Lesica and Shelly (1991, Sensitive, Threatened and Endangered Vascular Plants of Montana) should be consulted for more information on these ranking systems.

CAREX CRAWEI Dewey Craw's Sedge

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: British Columbia to Quebec, south to Utah, Wyoming and along the Atlantic Coast to Alabama.

In Montana this species has been found along the Teton River in Teton County and around ponds in western Pondera County, and it is reported from Beaverhead County.

HABITAT: In Montana, Craw's sedge occurs along streams and ponds in wet, gravelly soil that is flooded in spring but has dried by later in the summer. The species is generally restricted to areas of calcareous parent material.

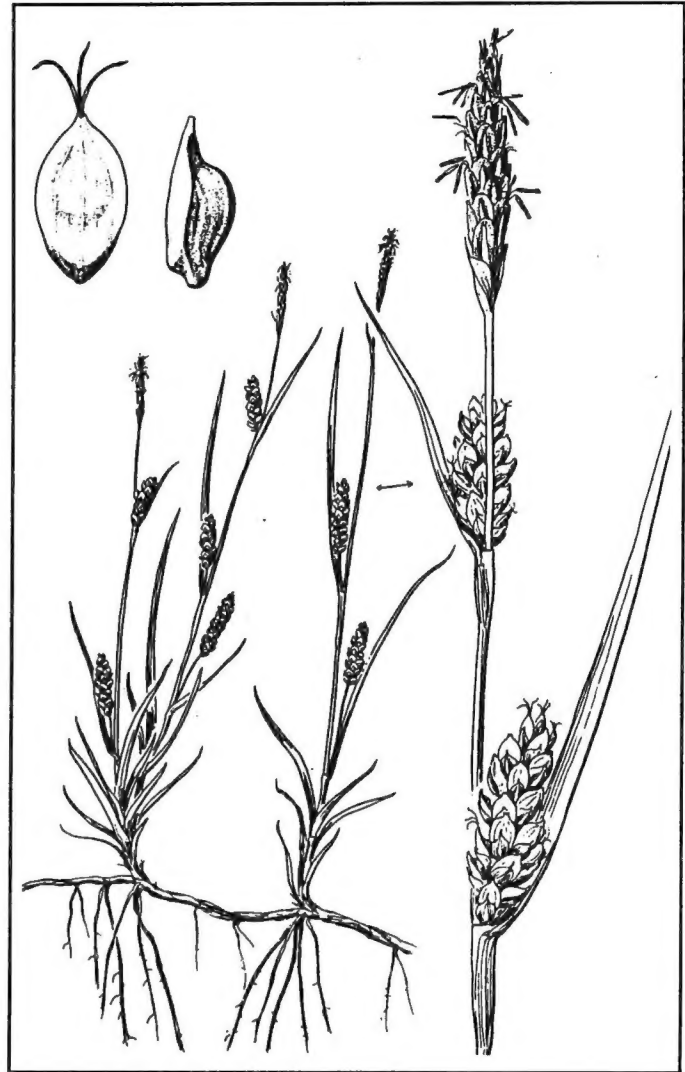
On Pine Butte Swamp Preserve, this sedge has been found along a gravelly side channel of the Teton River, southeast of Tetonview School and in the shoulder ditch on the north side of the Teton River Road sporadically between the Tetonview School and Eureka Reservoir.

PHENOLOGY: Mature fruit, allowing positive identification can be found from July through mid-August.

COMMENTS: Craw's sedge is considered rare in all the western states and provinces in which it is known to occur. All known Montana populations are small. It seems likely that there are undiscovered populations in other locations along the Front, but this species seems to be truly rare in western North America. I believe that it is more widely distributed in the central and eastern Canadian Provinces.

This sedge propagates by seed and vegetatively by rhizomes. It is almost certainly wind-pollinated.

The distinctively shaped fruits are the best field character.



CAREX LIVIDA Willd. Pale Sedge

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S2

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE:
Circumboreal, south in North America to California, Idaho, Montana, Michigan and New Jersey.

In Montana this species is known from Flathead, Glacier, Lake, Lewis & Clark, Missoula and Teton counties.

HABITAT: This species is confined to wet, peaty soils of fens in the foothills and lower montane zone. It generally occurs in areas of calcareous parent material.

On Pine Butte Swamp Preserve, pale sedge is very common in wet depressions (flarks) in open fen and dwarf carr vegetation in both the McDonald and Duhr fens.

PHENOLOGY: This sedge has mature fruits necessary for positive identification in July and August.



COMMENTS: Pale sedge is considered rare in both Idaho and Oregon. In Montana this species is known from approximately five relatively small fens in addition to the Pine Butte fens. The population on the preserve is undoubtedly the largest in Montana and perhaps in the western U.S.

This sedge propagates by seed and vegetatively by rhizomes. It is almost certainly wind-pollinated.

Pale sedge is most easily recognized by the whitish-green color of the foliage and its wet depression habitat.

CYPRIPEDIUM CALCEOLUS L. Yellow Lady's-slipper

FAMILY: Orchidaceae (Orchid Family)

HERITAGE RANK: G5T3/S2

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: Our plants are var. parviflorum Salisb. which occurs from British Columbia and Alberta south to Oregon, Idaho, Utah and Colorado. The var. pubescens (Willd.) Correll, with a larger flower, is found in eastern North America. The var. calceolus is found in Europe.

In Montana this species has been found in Flathead, Gallatin, Granite, Judith Basin, Lake, Lewis & Clark, Lincoln, Missoula, Stillwater, Sweet Grass and Teton counties.

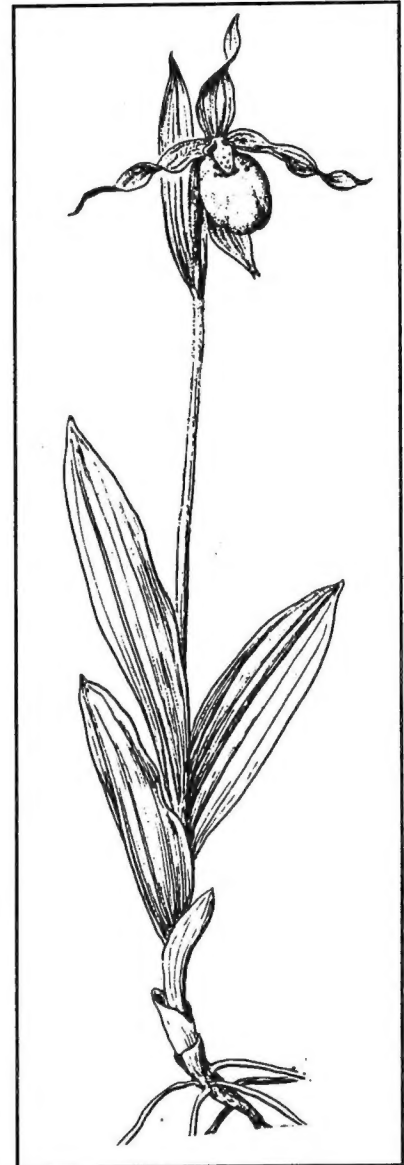
HABITAT: Yellow lady's-slipper is found in openings in moist forests or in the ecotone between mesic forest and wet meadows or fens. It seems to require moist or wet soil and partial shade. It usually occurs in areas underlain by calcareous parent material.

On Pine Butte Swamp Preserve, yellow lady's-slipper is common beneath shrubs on hummocks in dwarf carr vegetation in both McDonald and Duhr fens. It has also been found beneath willows along Willow Creek

PHENOLOGY: In an average year, this species flowers from mid-June through early July on the preserve.

COMMENTS: Although this species is found in many western states and provinces, it is listed as rare or endangered in all of them except Alberta. Hitchcock et al. (1969, Vascular Plants of the Pacific Northwest) indicate that the plant is rare in the Pacific Northwest, and Looman and Best (1979, Budd's Flora of the Canadian Prairie Provinces) state that the species is decreasing. In the western U.S., yellow lady's-slipper is probably more common in Montana than any other state, and the population on Pine Butte Swamp Preserve (probably more than 10,000 plants) is certainly one of the largest.

Yellow lady's-slipper propagates by seed and to some extent by short rhizomes. Although many plants bloom each year, relatively few seem to produce mature seed capsules. This suggests that successful pollination is an unlikely event, perhaps due to a paucity of pollinators. It is important to know what pollinates this plant and how the pollinators are distributed on the preserve.



ELEOCHARIS ROSTELLATA (Torr.) Torr. Beaked Spike-rush

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S2

MONTANA STATUS: Threatened

GEOGRAPHIC RANGE: Vancouver Island to Nova Scotia, south to northern Mexico, the Caribbean and the Andes of South America, mostly along the coastlines, but occasionally inland.

In Montana this species is known from Lake, Madison, Meagher, Park, Sanders and Teton counties.

HABITAT: Beaked spike-rush is typically a plant of coastal salt marshes; however, it also occurs sporadically in calcareous wetlands, especially around hot springs or warm springs. In Montana most populations are associated with warm springs.

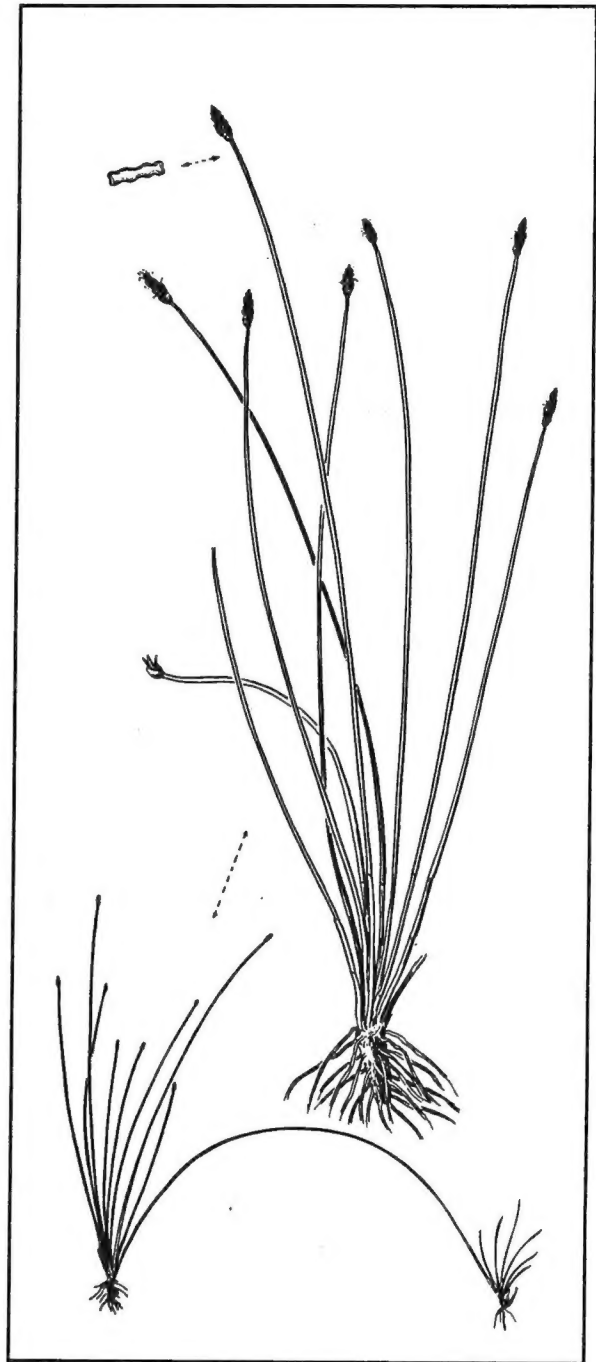
On Pine Butte Swamp Preserve this species appears to be very local in open fen vegetation in both the McDonald and Duhr fens.

PHENOLOGY: Beaked spike-rush blooms in June and has mature fruit in July through early September. The distinctive arching stems that root at the tip may not be conspicuous until August or September.

COMMENTS: This species is considered rare in both British Columbia and Washington. In Montana many of the populations are threatened by development of the thermal areas with which they are associated.

Beaked spike-rush is almost certainly wind-pollinated. It propagates by seed and by stems that arch over into the substrate and produce a small plant instead of an inflorescence. These arching, plantlet-producing stems are very distinctive and are the best field character.

The small colonies in the Pine Butte fens are thought to be associated with local areas of constant upwelling, providing an environment similar to a warm spring.



DOWNINGIA LAETA Greene Great Basin Downingia

FAMILY: Campanulaceae (Bellflower Family)

HERITAGE STATUS: G5/S1

MONTANA STATUS: Watch List

GEOGRAPHIC RANGE: Alberta and Saskatchewan, south to northeast California, Nevada, Utah and Wyoming.

In Montana this species is known from fewer than five locations in Beaverhead, Madison and Teton counties.

HABITAT: Moist soil that is submerged early in the season but dry by mid-summer, often in vernal pools or at the margins of marshes or ponds.

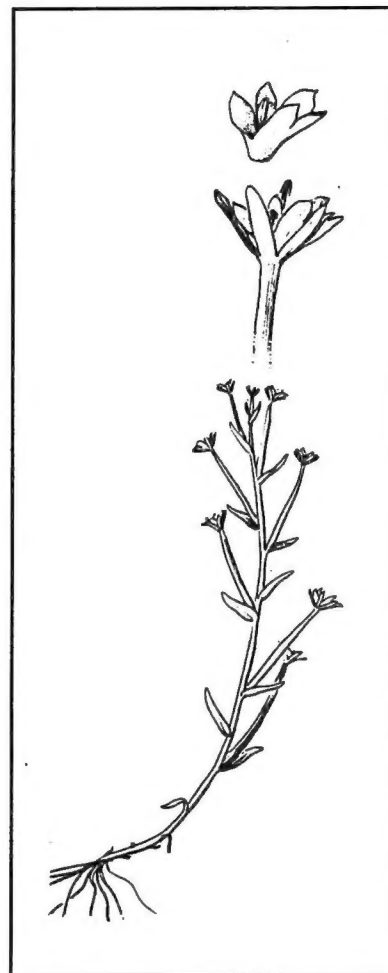
On Pine Butte Swamp Preserve, this species was found in small depressions that hold water in early spring on the south side of Willow Creek just southwest of the old Duhr House.

PHENOLOGY: Flowering of this species is variable depending on water levels. It probably blooms in late May or June.

COMMENTS: Great Basin downingia is rare in the northern portion of its range. It is listed as rare in Alberta and Saskatchewan and is under review in Oregon.

This species is an annual and may be rare in some years and more common in others. It is small and very ephemeral and can be found for only about four weeks after the water covering its habitat has receded or dried up. It has not been seen on Pine Butte Swamp Preserve since 1982.

Great Basin downingia is probably predominantly self-pollinated, but may occasionally be pollinated by small flies.



ERIOPHORUM VIRIDICARINATUM (Engelm.) Fern.
Green-keeled Cottongrass

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Sensitive

GEOGRAPHIC DISTRIBUTION: Arctic and boreal North America, south to Washington, Idaho, Colorado, North Dakota, Michigan and New York.

In Montana this species is known from Flathead, Glacier, Lake, Powell and Teton counties.

HABITAT: This uncommon cottongrass occurs in wet organic soil of fens and sphagnum bogs in the foothills or low elevations in the mountains.

On Pine Butte Swamp Preserve, green-keeled cottongrass has been found in only a few very small patches in the southwest part of the Duhr Fen. It occurs in open fen vegetation.

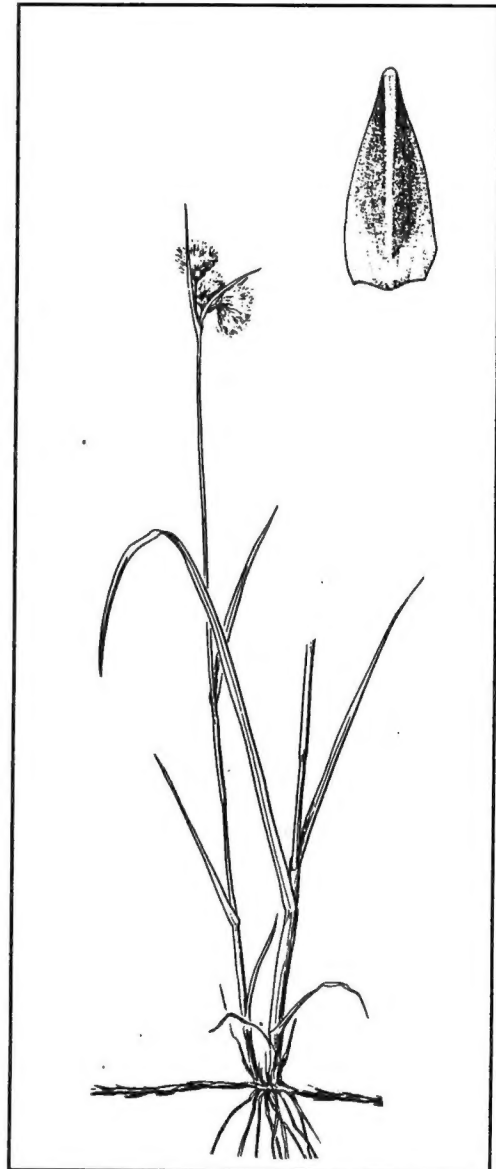
PHENOLOGY: This species blooms in early June, and the mature, white-plumed achenes can be found in late June through early July.

COMMENTS: Green-keeled cottongrass is considered rare in Idaho and Washington, and is listed as threatened in North Dakota. All known populations in Montana are small.

The population in the Duhr Fen was discovered in 1982. At that time I observed approximately 10-20 stems. In 1990 I observed 10-12 plants (8 in monitoring plots) in three small colonies, and in 1991 I observed only three plants in one colony. These observations indicate that the species may become extinct on the preserve.

This species is wind-pollinated and propagates by seed and vegetatively by rhizomes.

Green-keeled cottongrass is very similar to the more common, many-spiked cottongrass (*E. polystachion*); however, the former has bracts (scale-like, triangular-shaped structures found at the base of the cotton-like bristles) in which the mid-vein (keel) becomes broader towards the tip, while the latter has bracts with a narrow mid-vein that ends well below the tip.



GENTIANOPSIS MACOUNII (Holm) Iltis Macoun's Gentian

FAMILY: Gentianaceae (Gentian Family)

HERITAGE RANK: G5/S1

GEOGRAPHIC RANGE: Alberta and Saskatchewan east to Quebec, south to Montana, North Dakota and Minnesota.

In Montana this species is known from one location in Glacier County and Pine Butte Swamp Preserve in Teton County.

HABITAT: Wet, organic soil of meadows and fens, often in areas underlain by calcareous parent material.

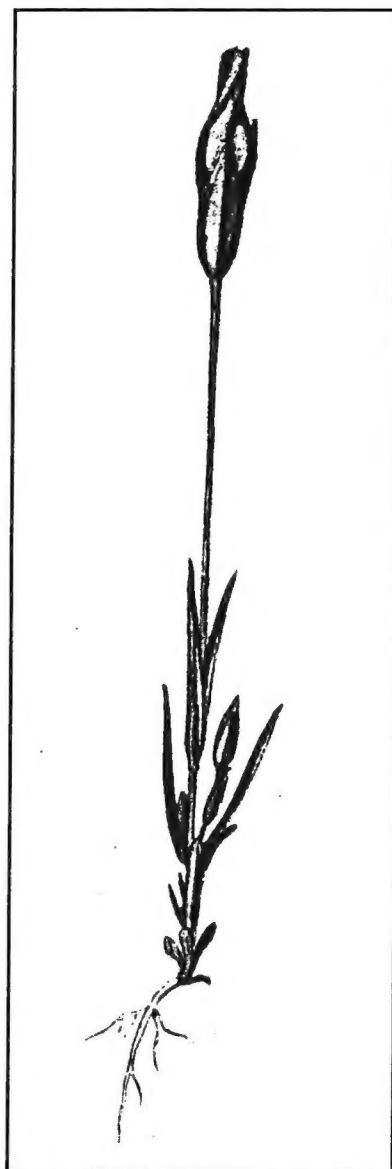
On Pine Butte Swamp Preserve Macoun's gentian is common on hummocks (strings) in open fen and dwarf carr vegetation of both McDonald and Duhr fens.

PHENOLOGY: This species flowers in August and early September.

COMMENTS: Macoun's gentian is common in Canada but is considered rare in North Dakota and Montana and probably also Minnesota, the only states in which it occurs. The population at Pine Butte Preserve is the largest in Montana and may well be the largest in the U.S.

There is a good deal of taxonomic confusion over this group of gentians. Hitchcock et al. (1959, Vascular Plants of the Pacific Northwest) consider it to be in the genus Gentiana and the same as the widespread G. detonsa. Gillet, a Canadian taxonomist, considered this plant a subspecies of Gentianella crinita. Finally, Iltis, in the most recent treatment of this group, segregated it as Gentianopsis macounii.

Macoun's gentian is an annual; plants must propagate from seed each year. It is unusual because it is the only annual occurring in the fen or carr vegetation. The pollinators are unknown, but thrips have been observed in the flowers. This plant may be at least partly self-pollinated.



GRATIOLA EBRACTEATA Benth. Bractless Hedge-hyssop

FAMILY: Scrophulariaceae (Snapdragon Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: Southern British Columbia to California, east to Montana.

In Montana this species is known from Cascade, Glacier, Teton and Yellowstone counties.

HABITAT: Moist or wet mineral soil that is inundated early in the year but drying by mid-summer, often at the margin of ponds or lakes in the valleys and foothills.

On Pine Butte Swamp Preserve this species occurs on the margins of a small pond on land administered by Lewis & Clark National Forest on the southwest side of Ear Mountain (T24N R8W S24) in the lower montane zone.

PHENOLOGY: Flowering of this species is variable depending on water levels. It is likely to be blooming in late June or July.

COMMENTS: Bractless hedge-hyssop is listed as rare in B.C. and Montana, the northern portion of its range. The collections from Cascade and Yellowstone counties were made more than 80 years ago.

This species is an annual and may be rare in some years and more common in other. Plants must propagate from seed each year. It is likely that this plant is self-pollinated, but small insects may also act as pollinators.



JUNCUS ACUMINATUS Michx. Tapered Rush

FAMILY: Juncaceae (Rush Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: British Columbia to Newfoundland, south to California, Arizona, New Mexico, Texas and Florida.

In Montana the only known location for this plant is Pine Butte Swamp Preserve in Teton County.

HABITAT: Tapered rush is found in wet soil of meadows, stream banks, and lake margins.

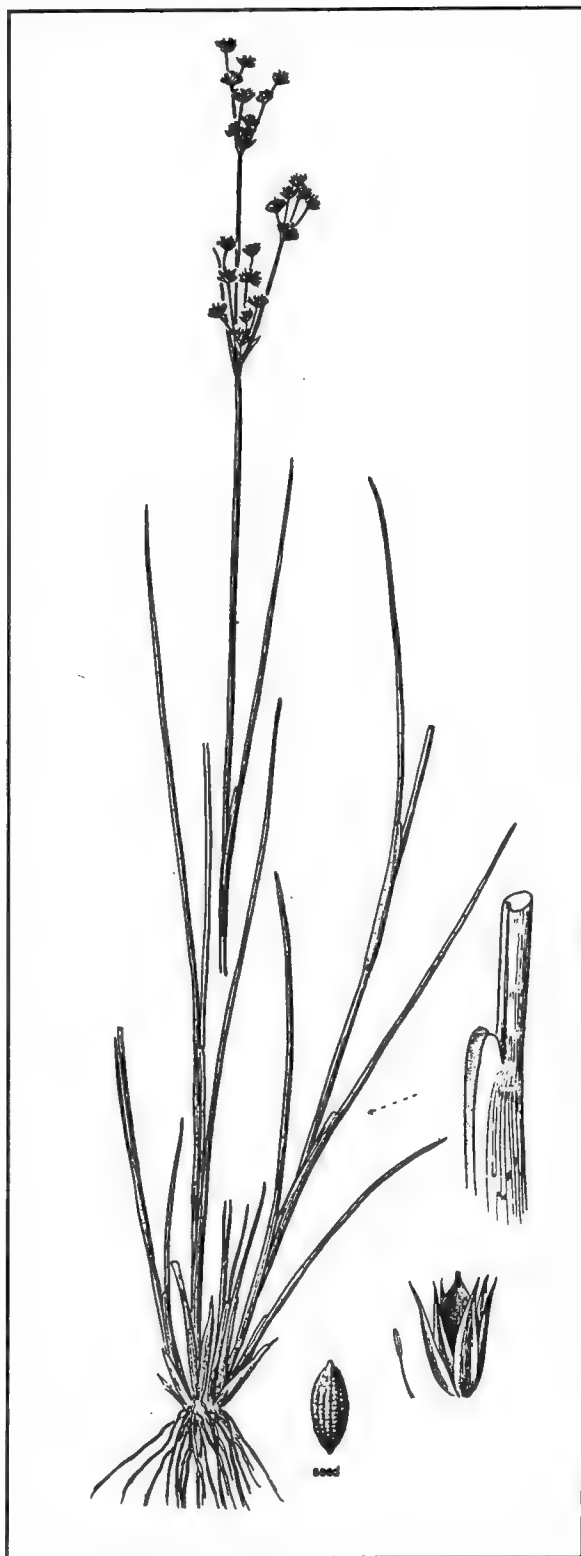
On Pine Butte Swamp Preserve, this species has been found in the wet, alkaline soil along the south edge of the large pond on the east side of Pine Butte (T24N R7W S17 NE1/4).

PHENOLOGY: Tapered rush flowers in June and early July with mature fruit in late July and August.

COMMENTS: The only Montana collection of this species was made in 1982. At that time only a small number of plants were observed. It may be more common on the preserve than is currently known.

Tapered rush is thought to be wind-pollinated, but small insects may also play a role. It propagates by seed.

Species of rushes are often difficult to distinguish. Tapered rush can be told by its non-rhizomatous habit, leaves that are round in cross-section, and seed capsules that are gradually tapered to the tip and longer than the petals and sepals.



KOBRESIA SIMPLICIUSCULA (Wahl.) Mack. Simple Kobresia

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Sensitive

GEOGRAPHIC DISTRIBUTION:

Circumboreal, south in North America to British Columbia, Oregon, Idaho, Colorado, Quebec and Newfoundland. Most locations in the continental U.S. are widely disjunct

In Montana this species is known from one small area of Glacier National Park, Glacier County and Pine Butte Swamp in Teton County.

HABITAT: Wet organic soil of fens, sphagnum bogs, meadows and tundra from the foothills and lower mountains, occasionally to above timberline.

In Glacier Park this species has been found only in wet tundra above timberline. On Pine Butte Swamp Preserve, simple kobresia has been found in dwarf carr vegetation in the McDonald Fen.

PHENOLOGY: Simple kobresia probably blooms in June with mature fruit in July and August.

COMMENTS: Simple kobresia is thought to be extirpated from both Oregon and Idaho. It is not known Washington. There is only one known location in Wyoming (Swamp Lake RNA). It is known from only a handful of sites in Utah and Colorado.

This species was first discovered on Pine Butte Swamp Preserve in 1991. It is currently known from one small colony on the southwest end of McDonald Fen.

This species is wind-pollinated and propagates by rhizomes as well.

Simple kobresia is best told by its narrow, inconspicuous inflorescence and wiry foliage. It looks much like a sedge (*Carex* spp.) but can be positively identified by the open scale that is wrapped around the seed. Members of *Carex* have a closed bottle-like scale around the seed.



OXYTROPIS LAGOPUS Nutt. var. CONJUGENS Barneby
Montana Rabbitfoot Crazyweed

FAMILY: Fabaceae (Pea Family)

HERITAGE RANK: G4T2/S2

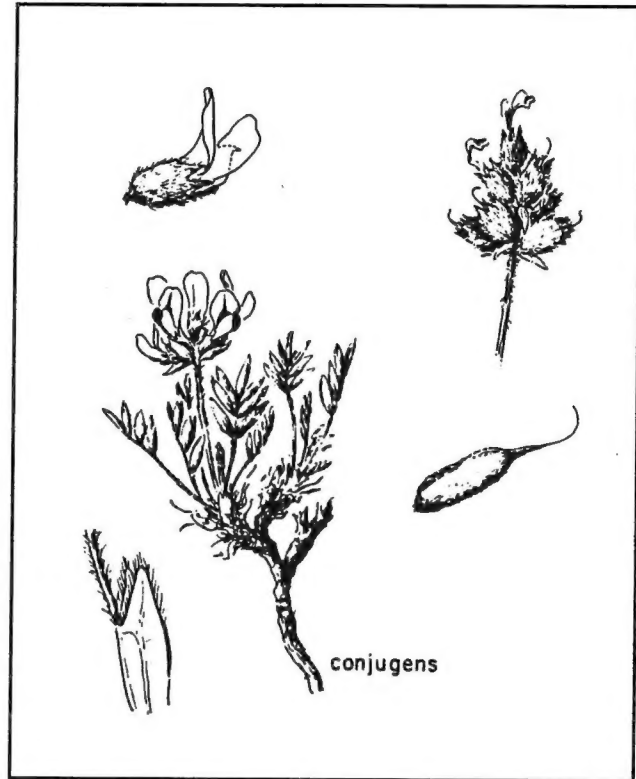
MONTANA STATUS: Limited
Distribution

GEOGRAPHIC RANGE: The species as a whole occurs in western Montana, Wyoming and Idaho.

The var. conjugens is endemic to Montana and has been found in Granite, Jefferson, Lewis & Clark, Madison, Powell and Teton counties.

HABITAT: Gravelly or shallow, often calcareous soil of grasslands and shrublands in the valleys, foothills and lower mountains.

On Pine Butte Swamp Preserve, Montana rabbitfoot crazyweed is common in the most arid grasslands, especially on windswept ridges and plains.



PHENOLOGY: This species flowers principally in May. The fruits, which are needed for positive identification, can be found from late May through June.

COMMENTS: This Montana endemic variety is very common within its restricted range. Due to its early phenology, it probably increases under livestock grazing.

Most species of legumes are pollinated by bees, especially bumblebees. However, since this species blooms so early it may be pollinated by flies or other types of native bees. It is possible that it also self-pollinates to some extent.

Rabbitfoot crazyweed blooms in May while the similar Bessey's crazyweed (O. besseyi) blooms in June. The endemic var. conjugens can be distinguished from the more widespread var. lagopus by having fewer leaflets (5-9 instead of 11-17) and by the pod which remains attached to the flower stalk and calyx until after the seeds have dispersed. In var. lagopus the pod and surrounding calyx fall from the stem before the pod opens.

SCIRPUS CESPITOSUS L. Tufted Clubrush

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S1

MONTANA STATUS: Watch List

GEOGRAPHIC RANGE: Circumboreal, south in North America to Oregon, Idaho, Utah, Tennessee and North Carolina.

In Montana this species is known from Beaverhead, Flathead, Powell and Teton counties.

HABITAT: Tufted clubrush is found in wet, organic soils of fens and sphagnum bogs in or near the mountains, occasionally up to timberline.

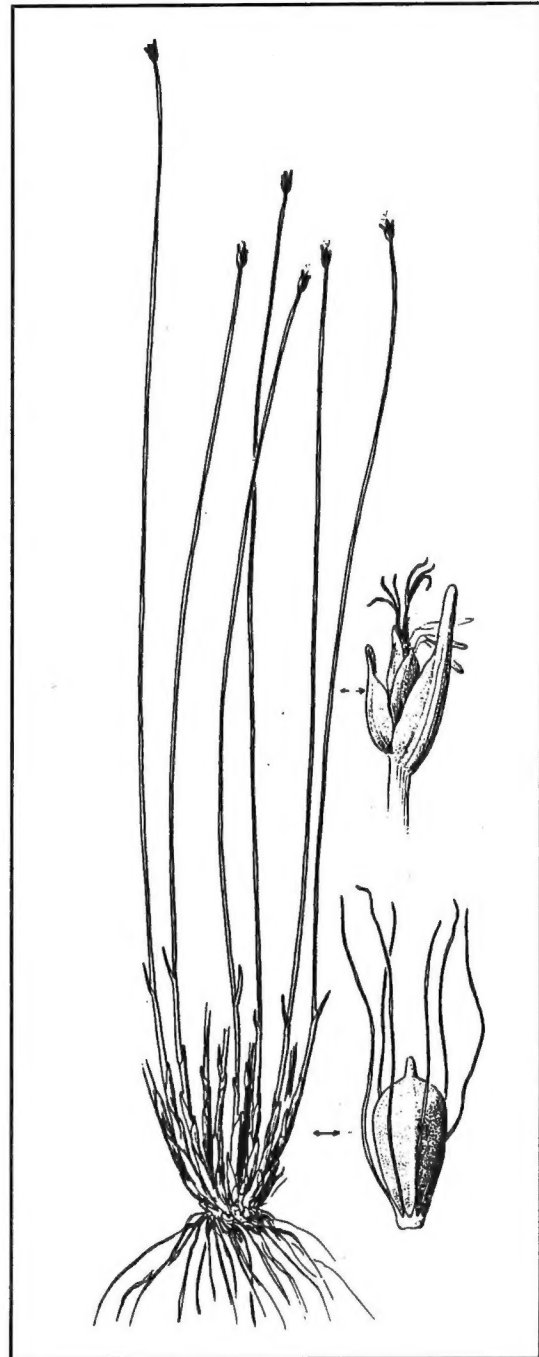
Large colonies of this species occur sporadically in open fen vegetation, often with hardstem bulrush (*Scirpus acutus*), in both the McDonald and Duhr fens.

PHENOLOGY: This species blooms in late May and June, and mature fruit is present from late June through early August.

COMMENTS: This species is currently known from only five bogs or fens in Montana. Two of these are in Glacier National Park.

Tufted clubrush is almost certainly wind-pollinated and is propagated by seed or by creeping rhizomes.

This plant forms very dense, conspicuous clumps of stems with a distinct yellowish-green color.



SCIRPUS PUMILUS Vahl Small Clubrush

FAMILY: Cyperaceae (Sedge Family)

HERITAGE RANK: G5/S1

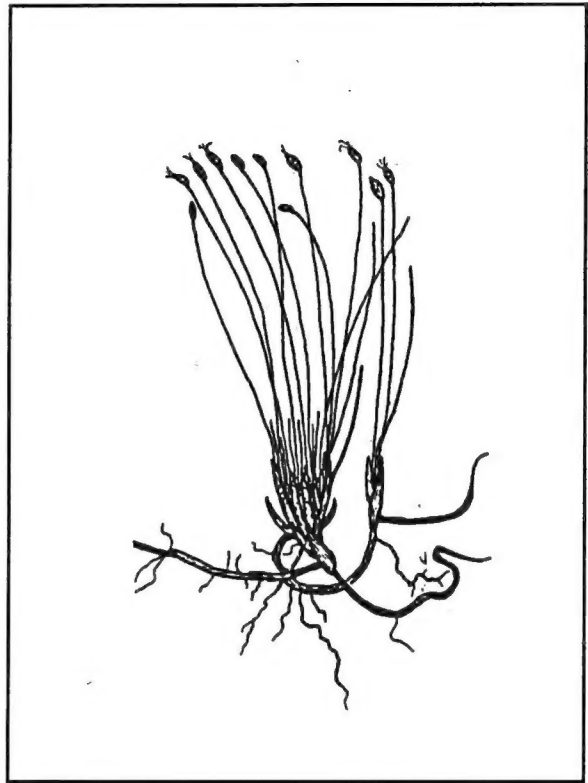
MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: Circumboreal, sporadically south in North America to Montana, Wyoming and Colorado. It is relatively uncommon in North America, and it is rare in all three states where it occurs.

In Montana this species has been found at one location in Glacier County and in the Pine Butte fens.

HABITAT: Small clubrush occurs in wet, peaty soil of fens in the foothills.

This species is common on hummocks (strings), often beneath small shrubs, in the dwarf carr and open fen in both the McDonald and Duhr fens.



PHENOLOGY: This species flowers in June and has mature fruit in July and August.

COMMENTS: Small clubrush was first found in Montana on Pine Butte Swamp Preserve in 1990. The only known location for this species in Wyoming is Swamp Lake, nominated for status as a Forest Service research natural area by TNC. There is only one known location for this plant in Colorado. Thus, the Pine Butte fens are one of only four known locations for this plant in the U.S. Pine Butte fens and East High Park Fen in Colorado have the largest populations.

Small clubrush propagates by seed and vegetatively by rhizomes. It is almost certainly wind-pollinated.

In mid to late summer the bracts of the inflorescence fall off, exposing the shiny black seeds at the top of the thin stems.

TRIGLOCHIN CONCINNUM Davy Graceful Arrowgrass

FAMILY: Juncaginaceae (Arrowgrass Family)

HERITAGE RANK: G5S1

MONTANA STATUS: Sensitive

GEOGRAPHIC RANGE: This species is found from British Columbia east to Montana and South Dakota, south to Baja California, Arizona and Colorado, and in South America. The var. debile (Jones) Howell is found inland, while var. concinnum occurs along the coast.

In Montana this species is known from two locations in Teton County and one or two locations in Madison County.

HABITAT: Graceful arrowgrass occurs in wet, alkaline soil of meadows, marshes and around ponds and lakes in the valleys.

On Pine Butte Swamp Preserve, this species has been found in wet, light-colored, heavy soil along the northeast side of the large pond on the east side of Pine Butte (T24N R7W S17 NE1/4).

PHENOLOGY: This species flowers in June and early July. It can be identified at any time of the growing season.

COMMENTS: All of the known populations of this species in Montana are small, and occur in very alkaline soils. The three sites outside of Pine Butte Preserve are associated with springs.

Graceful arrowgrass is probably wind-pollinated but small insects may also play a role in pollination.

Graceful arrowgrass often occurs with the more common, seaside arrowgrass (T. maritima). The two can be distinguished by differences in the ligule, the membranous appendage attached at the base of the leaf facing the stem. The ligule of T. concinnum has two rounded lobes, while that of T. maritima tapers to a single point.

